This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

WIDENER
HN UIBS +

WHAT NATURE IS

CHARLES FRANKLIN

Phil 9150.12

Harvard College Library

FROM THE BEQUEST OF

JAMES WALKER, D.D., LL.D.

(Class of 1814)

FORMER PRESIDENT OF HARVARD COLLEGE

"Preference being given to works in the Intellectual and Moral Sciences"

WHAT NATURE IS

AN OUTLINE OF SCIENTIFIC NATURALISM

BY

CHARLES KENDALL FRANKLIN

Author of "The Socialization of Humanity" and "The Future of the Human Race"

BOSTON
SHERMAN, FRENCH & COMPANY
1911

Phil 9150.12

Copyright, 1910
SHERMAN, FRENCH & COMPANY

CONTENTS

		Page
I.	Preliminary Orientation	1
II.	The Universal Process	4
III.	Matter and Energy	20
IV.	Idealism	27
V.	The Processes of Nature	33
VI.	The Expenditure of Energy	45
VII.	The Unity of Nature	50
VIII.	The Law of Repetition	54
IX.	Natural Selection	61
X.	Scientific Naturalism	68

I am now convinced, that no great improvements in the lot of mankind are possible, until a great change takes place in the fundamental constitution of their modes of thought. The old opinions in religion, morals and politics, are so much discredited in the more intellectual minds as to have lost the greater part of their efficiency for good, while they have still life enough in them to be powerful obstacles to the growing up of any better opinions on these subjects. When the philosophical minds of the world can no longer believe its religion, or can only believe it with modifications amounting to an essential change of its character, a transitional period commences, of weak convictions, paralyzed intellects, and growing laxity of principle, which can not terminate until a renovation has been effected in the basis of their belief, leading to the evolution of some faith, which they can really believe: and when things are in this state, all thinking or writing which does not tend to promote such a renovation is of very little value, beyond the moment.—

John Stuart Mill.

WHAT NATURE IS

An Outline of Scientific Naturalism

I

PRELIMINARY ORIENTATION

Humanity is no longer looked at from a traditional point of view. A concensus of the scientific thought of the world places Man at the head of the animal kingdom and explains his existence by natural law. Life has existed upon the earth for millions of years. In mankind, to-day, it has reached conscious existence. After arriving at maturity, and rejecting our allegorical and symbolical theory of things inherited from the past as inadequate and insufficient, and looking about us at Nature, studying matter and energy in chemistry and physics, investigating the facts of life and mind in biology and psychology, and meditating upon the phenomena of human action and conduct in economics and sociology, we are ushered into the real mystery of things, and not to find a solution is to suffer intolerable pain at our bafflement. Hence Man's eternal search for truth. But the life of the individual is so brief, and the historic period of humanity so short—at farthest not over ten thousand years—that, owing to lack of time for research and the accumulation of materials, the action and interaction of the elements and energies of Nature, even to-day, are deemed incomprehensible to the individual, and syste-

matic accumulations of knowledge of them form no part of the heritage of the race. Nevertheless, the necessity for a credible system of philosophy which will explain the Universe and man's relation to it to supplant our traditional theory of things is apparent to all inquiring minds. Its demand is insisted upon by the most advanced moralists of all nations.

Science teaches us that a rational system of living can be based only upon a rational theory of the Universe; hence it is the starting-point in the solution of the practical problems of life that immediately confront us; it is the foundation of the philosophy which will direct the future socialization of the race. While the constitution of our minds demands a philosophy of everything, yet our investigations of Nature so far, have shown us that it is unlimited and absolutely inconceivable. The human mind today is not commensurate with the Universe, but only with Nature immediately around us. In order to conceive a thing, we must limit it; but for every limit the mind places upon the Universe, there appears an unlimited Universe beyond. Still, as the human mind is a reaction of the environment, some subsequent discovery must of necessity, in the course of its development, make the Universe conceivable, as the discovery of the rotundity of the Earth and the development of the sciences of physics and

astronomy made possible a true concept of the Earth. Yet it is with reluctance that we try to understand what is going on out in the sidereal world beyond the solar system. It is so far away from us, and has heretofore been deemed to have so little, or no effect upon our destiny that whether or not we knew anything about it was thought to make no difference. There is nothing to-day in all the realms of thought which shows the impenetrable mystery of things and human impotency more than man's bafflement in contemplating the unlimited space of the starry depths. Contrary to the experience of the Psalmist that "the Heavens declare the glory of God," (Ps. xix, 1.) to-day, in the presence of this awful, infinite phenomenon, Man comes to himself and realizes that he is not a minion of Nature, as tradition has caused him to believe, but rather a being unfavored, unfriended, unfathered, simply the product of the ceaseless strivings of the elements and energies of Nature.

The problem before us is this: Given the elements and energies now at work in Nature, to explain human existence in naturalistic terms, to answer the questions: What is the Universe? What is Man? What is man's relation to the Universe?

It is by attempting the impossible that the greatest achievements in Nature have been accomplished.

II

THE UNIVERSAL PROCESS

The teachings of science show that the solar system is a vast process in the transformation and equivalence of energy. It begins with the maximum amount of radiant and the minimum amount of gravitant energy, effects a transformation of these two kinds of energy by dissipating radiant energy in straight lines into space, thus generating gravitant energy in heavenly bodies with a curvilinear movement which sweep the heavens, until finally after billions of years the conditions are reversed, and there exists the maximum amount of gravitant with the minimum amount of radiant energy: then the system collapses or collides with another, and the maximum amount of radiant energy is again developed; and all the matter is once more dispersed throughout the system and the process is begun over again. At the beginning of the transformation all the matter of the solar system, in its most attenuated form, fills the entire space of the system; at its end, all the matter in the highly concentrated forms of heavenly bodies is thrown upon its center with gravitant energy sufficient to produce radiant energy enough to disperse it throughout the system. Were the Earth alone to fall into the

sun, it has been calculated by Mayer, then by Helmholtz and Thomson, that it would produce heat equal to the combustion of more than five thousand worlds of solid coal.

At the beginning of a solar system gravitant energy manifests itself as the primordial particle of matter; and, its motion being in a line perpendicular to the course of radiant energy, the resultant of the two forces causes the movement of the particle to be curvilinear. This movement of the original particles of matter is communicated to all the bodies formed out of it; as a result, all bodies in space, gravitating back whence they came, move in curvilinear trajectories, thus taking billions of years to pass over the distance; otherwise the solar process would effect no equilibriums, matter would pass to the outermost confines of the system, then gravitate back in straight lines in a comparatively brief space of time to be dispersed again, and there would not be sufficient duration between the dominance of one energy and that of the other for the evolution of the Inorganic, the Organic and the Social Processes whose equilibriums are effected by the motions of the original particles of matter under the antagonistic influence of radiant and gravitant energy. In the beginning, as matter condenses, moving in curvilinear trajectories, before all the bodies formed can reach the original center of the

system, many centers of revolution are set up. Each of these finally evolves either into a planetary system, masses of planetoids, or rings of meteors, which, sweeping the heavens for ages, finally gather all the matter of the system into a few bodies before the final cataclysm, the collapse of the whole system at the end of the process.

No idea is more bewildering than the law of gravitation considered as the measure of an actual force, this being utterly inconceivable. According to this law, every particle of matter in a solar system attracts every other particle with a force proportional to the mass of each and inversely proportional to the square of the distance between them. While this law is attributed to Sir Isaac Newton, yet it is not found in any of his works and must be the product of some unknown disciple. The fact is that the law of gravitation is merely a mathematical formula of the relation existing between the heavenly bodies of a system, all Nature being constructed according to mathematical principles. Newton calls the law as he formed it a purely mathematical notion involving no consideration of physical cause whatever.* Instead of the heavenly bodies attracting one another, they merely fall towards one another because

* "The Mathematical Principles of Natural Philosophy." Vol. I, p. 5, by Sir Isaac Newton.

there is not sufficient radiant energy in and between them to keep them apart; and just in proportion as the radiant energy of a system is dissipated, in that proportion do these bodies come to a common center. The force to be measured by the law of gravitation was exerted by radiant energy in the original dispersion of matter, not the equilibriums effected by radiant and gravitant energy in the return of matter to its center whence it came. It is the action of the two forces of radiant and gravitant energy operating in different directions that causes all the equilibriums of Nature,—the Inorganic, the Organic and the Social Processes not an attractive force held in check by some other force, as it seems to be in the case of the heavenly bodies.

The only way we can separate matter in any of its forms is by radiant energy in some of its manifestations, and when the radiant energy is dissipated, the forms of matter come together in their original positions. To toss a ball in the air, for example: nothing is lost or gained. If the ball goes up with a velocity of sixteen feet per second, it comes back with the same velocity: gravitation adds nothing. Or else the forms of matter separated effect stable equilibriums which require still more energy to disintegrate—chemical compounds, living organisms and social organizations, for example.

When we toss a snow ball into the air a small amount of radiant energy in the form of mechanical energy is the force expended. The ball falls back to the Earth because there is not enough radiant energy in it and between it and the Earth to support it, and in its return it generates as much energy as was expended in its propulsion, which would not be the case if gravitation added anything, or if it were an independent force. It would be a mystery, indeed, if the body did not fall when it took so much energy to put it into the air, and the energy that had been supporting it was all expended. If it were forced back to the Earth by outside pressure, the commonly accepted explanation of gravitation, with an amount of energy equal to what it took to put it into the air, the mystery would be still greater. As it takes more radiant energy to put an object on the top of a high mountain than upon a small hill in a valley, so, if gravitant energy and gravity are the same thing, the object should have more weight on the top of the mountain than in the valley; but the opposite is the case. Gravity only measures the pressure of an object on the Earth where it rests, and whatever it may be, it is not a correlative of the energy it takes to put an object in its position, wherever it may be. Faraday showed that gravitation as a force contradicts the law of the conservation of energy.

But to return to our illustration. If the snow ball were reduced to watery vapor by a great deal of radiant energy, it would rise in our atmosphere, and would not fall until the radiant energy was dissipated; then it would descend as rain, and in its movements would develop energy equivalent to the amount that caused its rise. If the snow ball could be reduced to the original particles of matter by an incalculable amount of radiant energy, it might be wafted far out into space; but it would follow the same laws in its return as if it were simply a ball of snow. The force which puts bodies into space is radiant energy in some form or other. They return to their center when it is dissipated for want of support, and fall back with just as much force as it required to raise them.

All Nature is a repetition of itself,—the rise of water in the form of vapor from the ocean, to be blown by the winds to the north and south zones, there to meet with a dissipation of radiant energy, resulting in the fall of vapor as rain, to be collected on the Earth in streams, to flow, perchance, to the ocean again, if the radiant energy is not dissipated to such an extent that ice forms, for in that case it stops where it falls, maybe for ages until relieved by radiant energy in some other form, when it finally gets back to the ocean whence it came. This

is but a pseudo-miniature solar system that fails for want of materials, energy, space, time. Were a planet hot enough to dissolve some of its matter into its primal particles, it might drive a sufficient amount of it out into space far enough that, in its falling back, it would form a satellite. This is the probable origin of the retrograde satellites of our solar system. When, in the evolution of the solar system, planets were evolved, they, on a small scale, went through the same evolution and produced satellites; and were our system as large as Arcturus or Sirius, no doubt it would be possible even for satellites to produce attendant bodies.

The law of gravitation, like many of the phenomena of Nature, has been interpreted backwards—the geocentric theory of the heavenly bodies, for example. It explained all the phenomena of Nature, permitted the prediction of eclipses, the very strongest of all scientific proofs; yet it was just opposite to the truth—the heliocentric theory. The law of gravitation explains the facts, but instead of gravitation being an attractive force, it is a result of matter following the line of least resistance as determined by the contending energies—radiant energy acting in a straight line, gravitant energy perpendicular to it, the resultant being a curvilinear trajectory such as our heavenly bodies follow.

Professor Svante Arrhenius holds that the cyclic process of the solar system is initiated by a collision with another system, producing nebula, which, during countless centuries of evolution, finally develops into a new solar system. This, no doubt, may occur; but despite the great waste of energy in Nature, it looks more probable that every solar system should be self-sufficing, and not be dependent upon colliding with another system in a similar condition in order to complete its process. Besides, the absence of all radiant energy would certainly destroy the planetary equilibriums, and thus collapse the system. It may be possible in rare cases, owing to smallness of size, that some system would go through with its process from nebula to burnt-out sun, and not develop sufficient gravitant energy to produce force enough, when the system collapsed to redistribute all the matter throughout the system and thus form planets,—just as the smaller planets in our own system fail to evolve moons. In such cases the only possible way of redistributing the matter of the system would be a collision with a foreign body that would generate the necessary force. But this case is probably the exception, not the rule, or holds good for the smaller systems, and not the larger ones. In the case of a system like that of Arcturus, were it to collide with similar systems, inevitably

all the matter of the Universe would be collected into one system. But we see no evidences of that in the present condition of the starry depths. It would seem more probable that even "brute matter" in the larger systems is protected by the enormous amount of radiant energy, not only dispersing their own matter, but repelling the matter of other systems, thus preventing the matter of the Universe from aggregating in one system. It would seem that solar systems have a maximum as well as a minimum size due to the nature of radiant energy. When a solar system is dispersed throughout its space, it is probable that the radiant energy of contiguous systems drives it into those portions of space freest from matter, making it follow the line of least resistance. It is much more probable that solar systems take their proper motion from radiant than from gravitant energy; but their movement is expressed by the same mathematical formula. All the matter, however, of each and every system in its internal motions follows the laws we have attempted to outline.

The great obstacle in the study of sidereal phenomena is an imperfect understanding of what radiant and gravitant energy really are; and while the philosopher can state the facts in general terms, the specialist sticks to the theories of the great men of the past like a savage to his God. The specialist should re-

examine his principles instead of condemning the theories of living philosophers. This Arrhenius has done in regard to radiant energy;* but the ultimate theory of things will not be complete in detail until the same is done for gravitant energy.

Matter manifests itself in several states: solids, organic bodies, liquids, gases, which we know by our own senses, and the primordial particle and the interstellar matter of space, which we infer from reasoning. These different states are determined by the amount of radiant energy that is present to condition them. At its maxium, no equilibriums can be formed, nor at its minimum; but between the two extremes are developed the Inorganic, the Organic and the Social Processes. Our old conception of "brute matter" has so perverted our minds that, outside of our own bodies, matter instead of being deemed self-active is thought to be absolutely passive. The truth is that all matter in some degree is self-active. The forces of the heavenly bodies reside in them, just as the forces in atoms reside in them, and human forces reside in human beings, and social forces reside in social organizations, the highest form of matter that we know anything about. But this does not mean that the forces of the

* "Worlds in the Making," by Prof. Svante Arrhenius, chapters VI. and VII.

heavenly bodies can act other than they do. But it does mean that their movements are not determined by outside forces; instead, they are controlled by the radiant and gravitant energies of Nature in and about them, as we see them every day manifest here on earth. It is only living beings that can direct motion, and social organizations that can expand energy with perfect economy. In all the rest of Nature all energy follows the line of least resistance as determined by the contending energies in opposition and neutralization.

This theory of gravitation obviates the necessity of bodies acting upon one another at a distance, a fact that has made all the best mathematical minds of the race disbelieve in gravitation as an attractive force, beginning with Newton and ending with Du Bois Raymond, and makes the motion of the heavenly bodies similar to our experience with matter and energy here on earth. In addition to that, this explanation of the law of gravitation makes the energies of the heavenly bodies, like all other bodies, reside in themselves and not be impressed from outside sources. It was Kepler's confusing gravitation with magnetism that started the world wrong in its interpretation of this phenomenon, and in spite of the warning of Newton in his third letter to Bently, it has been misled ever since. There are but

two other phenomena that are as baffling as the law of gravitation, as commonly interpreted as action at a distance, and those are eternal time and infinite space. But the explanation here given reduces the phenomenon to that of common experience, and it is as easy of comprehension as any of the other facts of Nature.

The action of comets under the influence of the planets has been interpreted as a proof of gravity as a cause of motion and not a mathematical relation. But we forget that we know of two actual attractive forces in Nature other than gravitation—magnetism and electricity—and these are ample to explain the phenomenon of comets, because electricity in addition to being an attractive force is also a repellant one. If we work with the facts we have, it will not be found necessary for us to evoke any new ones.

The solar system is a process so stupendous that, in comparison with the Organic and the Social Processes, it seems to be a mere analogy; but in fact it is a fundamental truth of philosophy. Its forms are produced from gravitant energy; its functions are performed by the various manifestations of radiant energy. As a process, the solar system is more imperfect than either the Organic or the Social Processes; yet its structures are so arranged that its energies expend themselves in the same ways, such expenditure being natural laws.

When looked at rightly, there is no more mystery in a solar system than in a chemical molecule, each being controlled by similar energies, subject to similar destinies. The chemical molecule, in fact, is a miniature solar system; or, a solar system is an enormous molecule.* Nature knows no large or small; for it uses the same kind of energy, expended according to the same laws, in all its phenomena.

All solar systems, units in the great Universal Process, pass through a definite evolution, producing the phenomena of life, mind and society, being higher forms in the expenditure of energy, beginning with the fundamental law of Nature, the dissipation of all energy along the line of the least resistance as determined by its conditions in the Inorganic Process, and finally reaching the acme of development in the expenditure of all energy with perfect economy in the ultimate Social Process, afterwards declining, and ultimately reverting to the original elements and energies of Nature.

Such sublime phenomena are taking place out in the Universe constantly; for we find there solar systems at all stages of existence, from nebulous mass to burnt-out sun (our system seeming to be mid-way between these two stages); but owing to our imperfect develop-

* Sir Oliver Lodge in the *Athenaeum*, May 27th, 1905, p. 551.

ment, they pass unnoticed except by a few specialists. These phenomena are unlimited in number and are at all stages of development, so that while the human race itself will not live long enough to observe any of them in detail, yet as we can see the different stages in all, we can obtain a conception of the whole from what we learn from each, assisted by the fact that Nature is but a repetition of itself in all its forms.

In the nebulae of the sidereal world we see Nature in its most stupendous operations and get a first glimpse of the crude essence of things which reaches its highest development in the Organic and Social Processes. When we once adopt the naturalistic point of view, we see in these first forms of Nature dim adumbrations of the phenomena that are fully developed in ourselves. Nature ceases to be that terrifying mystery which has given birth to all our symbolical and allegorical theory of things, and becomes a simple process; and we take delight in consciously perfecting the processes that the blind energies of Nature have taken billions of years to bring up to their present stage of development.

Necessarily much that is written about the solar systems is pure hypothesis; but the hypotheses, heretofore, were not controlled by any general theory of naturalism. It would be mar-

velous indeed, if a philosopher in the present stage of knowledge could give an account of the most stupendous and the most infinitesimal phenomena of Nature that future ages would verify; yet many of the guesses of the Greek philosophers are being verified by modern science to-day. All that any one can hope to accomplish is to give an hypothesis in the most general terms. Details can only be attempted by mathematical physicists, and it would be well even for them to remember what the celebrated Buffon said in apology for his theory of the solar system: "I might have written as thick a book as Burnet or Wiston, if I had wished to expand my opinions in their manner; and I might have given weight to my deductions by clothing them in mathematical garments, as the latter has done. But I believe that hypotheses, however probable they be, should not be treated by such apparatus, which savors just a little of charlatanism."

But the philosophy of Naturalism does not stop with a cosmic theory. It is the study of Nature about us and in us which will produce that revelation, that falling of the scales from our eyes, that seeing of things face to face which the heart of man has ever craved, not the contemplation of the galaxy of the heavens, no matter how grand and sublime it may seem, or how ingenious our theory of it may be. So

in our investigation, it will best repay us to study the simple facts of our environment and our own lives, leaving the Universe to be understood from the light gained from the investigation of the parts closest in touch with us.

III

MATTER AND ENERGY

In our study of the factors of Nature—matter and energy—while we are limited on the one hand by the incalculably large, the Universe, we are limited on the other by the incalculably small, the ion, the electron, the corpuscle, or whatever name our philosophical physicists are pleased to call the ultimate particle of matter. Between these two extremes, the human mind is capable of classifying all the phenomena of Nature and giving consistent and logical explanations of them. What is more, if we only knew how to use it, such immediate knowledge is a key to the understanding of the whole Universe; for a profound survey of Nature shows it to be only a repetition of itself in many forms. While the human mind has been developed with the practical function of adapting man to his environment; yet the theoretical understanding of all Nature is also within its purview; because through the constant return of Nature upon itself, man becomes a microcosm, a repetition of the great macrocosm, the Universe. So we may as well, first as last, know that the ultimate secrets of the Universe are properly within the limits of scientific investigation. Knowledge begins with matter and energy, and ends by explaining all Nature in their terms.

By induction we know a great deal about matter in its outward forms, but when it comes to understanding its inmost nature, it is by looking at matter in the hidden recesses of our own being, and tracing its various forms by analogy to ourselves, that we understand it. We shall know the ultimate constitution of things through reason, not through our senses. The greatest fallacy of all learning is to give a higher degree of certitude to the present impressions of the senses than to the operations of the intellect—the accumulations of ages of sense-impressions—or to consider only the knowledge one learns from an investigation of external Nature, paying no attention to the accumulated knowledge of the race and what is organized in our very being. Man really learns more about the Universe by studying matter and energy within himself than without in Nature. For in this sense knowledge is inherited. Man is the repository of the experience of the ages. He does not of necessity have to relearn everything in his lifetime. Besides, man, being the highest developed form of matter, has within himself the most perfect manifestation of all its properties. As a result we have within ourselves the knowledge that is to unlock the secret of the Universe. But our inductive theory of science has made us think that the only way to know all Nature is to

study all Nature, when, in fact, Nature is so much a repetition of itself that, if we know any one thing well, we can know everything by analogy; and when we know ourselves perfectly, we shall know everything. But we shall use both methods of investigation in this essay.

All Nature has been reduced to two manifestations of energy: gravitant and radiant.* Gravitant energy (chemism, cohesion and so on) constitutes matter; radiant energy (light, heat and so forth) constitutes the conditions of matter.

Science has done much to resolve all the complicated forms of radiant energy into simpler ones, and has demonstrated their transformation and equivalence. Light, heat, electricity, mechanical energy constituting the conditions of matter are all convertible. All radiant energy can be reduced to one form. For example, the heat of the sun, stored in coal, is transformed into mechanical energy through steam, and mechanical energy in the dynamo is changed into electricity, and electricity in the trolley car is again transformed into mechanical energy, which is used in locomotion and finally dissipated in friction as heat. But as to their inmost nature, the radiant energies heretofore have been considered impenetrable

* "Principles of Mathematics and Physics" by James Challis.

mysteries, because, owing to our traditional theory of things, we have looked for an explanation of them, not by tracing them through their various manifestations up to ourselves, but by something supernatural outside Nature wholly unlike ourselves. What radiant energy is in terms of something totally different can never be known. It is understood primarily in its effects upon us, because it is in these accumulated effects—mentality—that we find an explanation of radiant energy in the terms of mind, and an explanation of mind in the terms of radiant energy, showing that they are one and the same thing differently manifested. We can only know the ultimate nature of radiant energy by showing its kinship to mind, and the ultimate nature of mind by showing its kinship to radiant energy.

The gravitant energies constituting matter, apparently unlike radiant energy, seem to be unchangeable; yet in chemical compounds and organic bodies, they lose, for the time being, their specific qualities and take on others apparently totally different, thus producing the most surprising phenomena, but always holding within themselves the power to revert to their original forms and qualities and always in the end doing so. For example, the tissues of the human body are composed chiefly of oxygen, carbon, nitrogen and hydrogen. The proper-

ties of these substances are lost for the time being, and, in their combined form, they take on others such as contractility, irritability and so forth. But by chemical analysis a piece of human tissue can be reduced to its original elements and it will be seen that they have not diminished in quantity, nor lost any of their original qualities, showing that the new qualities are but the developed forms of the original properties of matter. At each combination of the simple elements, new properties are displayed, until by combination and recombination, by organization and reorganization, living tissue is finally produced with all the properties of human beings. The fact is that the gravitant energies of matter are just as capable of transformation and equivalence as are the radiant energies of Nature, but heretofore we have not been able to trace them owing to our inability to see them in their higher manifestations in ourselves. But with the light of Scientific Naturalism, the higher forms of the internal, gravitant energies of the Organic and Social Processes can be traced to the original gravitant energies of Nature, because the higher forms of gravitant energy are developed in each of these processes.

The dynamic theory of matter is that it is composed of centers of motion; that its atomic motions cause all its combinations—first, ele-

ments (iron, hydrogen, sulphur); then chemical compounds (salt, lime, water); then organic bodies (plants and animals); then social organizations (tribes, nations, civilizations); and, lastly, that the elements, compounds, organisms and organizations thus formed are the resultant of the original atomic activities and their developed forms as conditioned by radiant energy in its various manifestations.

According to this theory the energy of matter is gravitant, curvilinear, rotary; while the energies constituting the conditions of matter are radiant, linear, wave-like. Radiant energy passes from the outermost confines of the Universe to the outermost confines. It puts all Nature in touch with itself, whereas all the visible forms of matter—suns, planets, satellites—have a rotary and curvilinear motion; so it is reasonable to suppose that the ultimate particles of matter in all their forms are rotating and revolving and are held together in their respective orbits by some form of gravitant energy in some such manner as are heavenly bodies in space.*

Matter is the static form of energy; energy, the dynamic form of matter. While the atomic motions, or, as we call them, the internal, gravitant energies, cause all the combinations and

* "The Principles of Chemistry," Part IV. p. 454, by Prof. Mendeleeff.

organizations of matter; yet their activity and development depend upon external, radiant energy in its various manifestations. The spectroscope shows that in the stars of the highest temperature there are very few elements, and as the stars decrease in temperature, the elements appear; and when we reach a lower temperature, chemical compounds supervene, while in a very low temperature, as here on earth, all the higher compounds of matter are developed, including the inorganic, the organic, and the social.*

While Professor H. A. Lorentz, Sir Joseph Larmor and Sir William Thompson and other physicists have given to the world brilliant mathematical theories of matter, probably none will stand the test of time. But this much will remain, that all matter is composed of centers of motion and its combinations and organizations depend upon radiant energy in its various manifestations. The ultimate nature of matter cannot be understood by a search after its ultimate particle, but by a study of its highest form, that is, ourselves. It stands to reason that anything is best understood in its highest form; and matter is no exception, although heretofore it has always been considered one.

* "Inorganic Evolution," by Sir Norman Lockyer.

IV

IDEALISM

While we may somewhat anticipate our argument, let us at this point briefly discuss the naturalistic conception of matter in relation to the philosophy of Idealism.

No philosopher has ever deigned to consider for a moment that any of the qualities of human beings are the developed properties of the elements and energies of Nature. We are altogether something different; yet, upon the closest analysis, we can find nothing else but matter and energy in our composition. Idealism, as a matter of fact, takes the human mind and by a process of subtilization makes out of it a mysterious entity, the Absolute, and out of it creates the Universe. According to this philosophy, nothing can be known but ideas; and while the body and brain are nothing but matter and energy, they are supposed to give no characteristic to our being. It is triumphantly stated that all we can know is ideas; that Nature itself is only an idea; and we can never in any way get beyond ideas. Yet Naturalism shows that our ideas are identical with the energies producing them; hence it explains Nature in terms of our ideas and our ideas in the terms of Nature.

If we can know only ideas, can we know

them? What are they? What are they made out of? They are evidently a developed product. What are their elements? How are they produced? If we can only know ideas as they appear in our minds, then we can not know them; for in what terms can we explain them? An explanation of a thing is to trace it to its source and give its history and philosophy. This investigation inevitably leads us to the elements and energies of Nature, showing in the end that our ideas are identical with them, and it is in this way that we know what our ideas are and what energy is. When we get through with the analysis of the intellective and motive sides of our nature, we find that we are the highest developed form of the radiant and gravitant energies of Nature.

Idealism states that all we really are is purely spiritual, that is, not matter, but a postulated something totally different. Matter is only the house in which we live, and has no more intimate relation to spirit than a house has kinship to its occupant. A moment's thought ought to show us the origin of our brains, our senses, hence our mind. By tracing the evolution of animals, we see that the senses, then the intellect is a product of the radiant energies of Nature; that our ideas are but a repetition of radiant energies registered in our nervous system during the vast era of life here

on earth. Were we to make an analysis at this time, we should find that the internal, gravitant energies of Nature evolve into the emotions of selfishness, love and religion; and, when organized with the intellect, constitute our inmost being; and that all we are or can hope to be is a developed product of the simple elements and energies about us. This analysis shows us that there are two aspects to Nature, a mental and a physical, and that the mental is a repetition of the physical and is identical with it in kind and substance; so that we know what our ideas and feelings are in the terms of matter and energy, and what matter and energy are in the terms of our ideas and feelings. We can know Nature just in proportion as it is repeated in us, and, imperfect as we are to-day, our development is such that we can confidently predict the complete understanding of the elements and energies of Nature as the ultimate destiny of our race.

Idealism explains Nature by ideas, not ideas by Nature. It gives the effect for the cause, makes the elements out of the product. It explains Nature by saying that its highest and greatest phenomena, mind, morality and religion, when personified as the Absolute, are the cause of its elements and energies, when they are in fact a development of them. Who can trace the history of an idea from the Absolute?

There is a semblance of truth in Idealism because it attempts to explain Nature by unravelling its finished products instead of showing their evolution from the primordial elements and energies of Nature. Naturalism condemns Idealism because it attempts to read the book of Nature backwards, and as a result today deluges the world with a maze of metaphysical theories that explain Nature by involution instead of by evolution, and thus mystifies everything so that we close the book of Nature as inexplicable. Like the Ptolemaic system of astronomy, it is right in everything except the point of view,—but the point of view is everything. At its worst, Idealism is a system of arrogant obscurantism; at its best, a system of sterile metaphysical speculations which do not permit humanity to become aware of its actual situation.

To-day Idealism defeats Naturalism not by refutation, but by possessing all the centers of learning, usurped from theology (the devotees not being able to detect the usurpation owing to the similarity of terminology), and thus by covering every avenue of philosophical expression, crowds Naturalism out of existence; so that in spite of the efficiency of Science, the irrefragable argument of Scientific Naturalism, there is little demand for a philosophy of reality, utility and positive knowledge.

Idealism is just as unorthodox as Naturalism, but the Church does not know it, for, being adroitly presented in a philosophical jargon, which means one thing to the adept, another to the novice and the dupe, it meets with an unmerited popularity that has nothing whatever to do with its truth or falsity.

The only hope for the perfection of humanity to-day lies in the distribution of sound philosophy among the masses; for no cause so helped the swamping of Greece and Rome with Oriental ignorance and error, religious fanaticism and mystic superstition as the fact that the philosophy of these great nations was possessed by only a few of the upper classes. When next humanity hears in its heart the call of the wild, when it is thoroughly sick of our present civilization, if the cry falls upon the enlightened ears of an intelligent proletariat, the liberty it engenders will result in the evolution of a higher Social Process than the present one; but if not, then once more will humanity resort to primitive Nature, to be free from a system of philosophy which permits a form of justice that is a crime, a civilization grown to be worse than savagery, and social institutions which, instead of saving human energy, waste it.

The reason that error is so prevalent in the world to-day is because it is taught us from our infancy up. While our false philosophy

is wrong in substance, yet its method of propagation—the school—is almost perfection itself. Strange indeed that naturalistic philosophers have not seen this palpable fact, and, instead of wasting their lives in useless argument, begun reforming the world by the establishment of schools of real learning from kindergarten to University, for then in less than one century the race would reach social consciousness and perfect living.

There is this to give us hope. The first principle of error—as illustrated in Catholicism—is absolute conservatism, that is, positive opposition to adaptation to the environment, making inevitable the certainty of its extinction, not from outside attack, but inside decay and assuring the ultimate triumph of truth by the natural death of error. Or if error attempts adaptation to the environment, as is illustrated in Protestantism to-day, for example, it loses itself in the adaptation it inaugurates, and thus by substituting fact for fiction, science for tradition, ends by being something altogether different, the ultimate expression of the religious nature of man. So that whichever course error chooses to pursue, its extinction is inevitable. Idealism may persist longer than vulgar error because of its adroit presentation, but being erroneous, it can not be a final philosophy either in substance or method.*

* For a further discussion of Idealism see the author's book, "The Socialization of Humanity," Chap. VII.

V

THE PROCESSES OF NATURE

A brief survey of Nature shows that the interactions of gravitant and radiant energy have resulted in three systems of existence, capable of classification, yet closely related to one another. They are the Inorganic, the Organic and the Social Processes. While this classification of the phenomena of Nature is possibly the commonest ever made, yet its real significance has never been shown. To trace the true relation of the Inorganic to the Organic and the Organic to the Social Processes, showing how the one evolves out of the other, is the special function of Scientific Naturalism. The time was when Nature was regarded as a chaos out of which mankind grew through supernatural power. But the fact well established to-day is that Nature is a continuous growth and that its three systems of existence are but different forms of the same thing. We will briefly consider, first the Inorganic, then the Organic, and lastly the Social Processes, and trace in outline Scientific Naturalism, showing that while these three systems are different, yet they develop from one another and that Nature at heart is a unity.

The Inorganic Process. All the phenomena

of Nature are problems in the expenditure of energy. Before the evolution of mentality and morality all the energies of Nature expended themselves according to the three laws of motion as worked out by Kepler, Galileo and Newton, which are as follows:

"*First*, that every body continues in its state of rest or uniform motion in a straight line, except in so far as it may be compelled by impressed force to change that direction; *Second*, that change of motion is proportional to the force applied and takes place in the direction of the straight line in which the force acts; *Third*, that to every action there is always an equal action in an opposite direction."

These three laws of motion may be summarized in the first law of the expenditure of energy in Nature, to wit: That all energy takes the line of the least resistance as determined by the contending energies in opposition and neutralization. It will be seen, according to these three laws of motion or the first law of the expenditure of energy that all energy acting to produce any given phenomenon is used up at one fell stroke. If two moving inorganic bodies oppose each other, all their energy is neutralized in opposition. As a result, the Inorganic Process, with the possible exception of the heavenly bodies of the solar system, is the most extravagant system

imaginable, the most wasteful. This does not mean that the energies are destroyed, but that they do no definite work, are dissipated in neutralization and opposition and accomplish nothing but aimless actions, the energy of which, if under the control of mentality and morality, could be used to some one purpose: electricity, for example, before it was utilized by man in the last three centuries.

Think of the energies of inorganic nature here on earth that could be expended more economically than they are, if a being even with man's mentality had the power to use them! Take, for example, the ill-arrangement of the rain-fall. Consider the vast amount of rain that goes back into the ocean, never having touched the parched and arid plains that so much need it; or of that which falls on bleak and inaccessible wastes; yet an infinitesimal amount falls upon suitable places and at opportune times, which, with the co-operation of sunlight, enables plants and animals to live upon the earth. What is true of the rain-fall is true of all the operations of inorganic nature here on earth, with the possible exception of the energies of atomic and molecular compounds. It is estimated that the earth receives only one two thousand and three hundred-millionths part of the solar radiation, and that the rest of the planets and moons of the system not more than ten times as much.

The arrangement of the planets in our solar system is such that probably the earth is the only one now habitable. Had they been produced by intelligence, instead of the blind law of the expenditure of energy along the line of least resistance in opposition and neutralization, been put in the proper position, and been made just the right size, they would all have reached the widest and highest possible development of matter in the system. But as they are, man is led to believe that the solar system has been produced that he might live, "the sun to light his path by day, the moon by night," for this is a reasonable hypothesis in such a waste of energy.

Our criticism is still more pertinent in the sidereal world. It is properly described as chaos. If there is any other method of the expenditure of energy there than the first law, the mind of man so far has not been able to discover it. But this is what is to be expected, if mind is a result of the evolution of Nature, and not its cause. The presence of mind is as easily detected as that of any other energy. There is none of that economic expenditure of energy in the sidereal world or in our solar system which indicates mind, but instead a waste of energy which denies it in every phenomenon. This of itself should refute Idealism.

The most advanced scientific knowledge shows

that the dissipation of energy before the origin of life and mind was aimless. It is so now in all the realms of Nature uncontrolled by animal life or mankind. The possibilities of matter and energy are wonderful; but owing to the unintelligent arrangement of things throughout the sidereal world, the solar system and inorganic nature here on earth nothing is accomplished save blind actions, relieved now and then by a happy co-operation, due to the continuous interaction of blind energies expending themselves along the line of least resistance, during infinite time, throughout infinite space, dealing with an infinite number of objects. This is all the design and purpose there is in Nature until we come to the Organic Process. Seldom in Nature does an action, or an interaction of moving inorganic bodies end in anything but waste of energy; but in the course of aeons of time in the solar system this wasteful expenditure of energy ends in conditions suitable for the development of the Organic and Social Processes. There is not much co-operation among men, less among animals and practically none whatever in the inorganic world. These facts are patent to every one.

But this waste of energy is not the case in the Organic and the Social Processes. In the Organic Process, external energies are used to

discharge a portion of the internal energies in animal bodies so as to enable them to vary the Law of Action and Reaction by taking the line of least resistance as determined by sense-impressions and ideas, instead of the contending energies in opposition and neutralization. It is in this ability to so expend energy that the Organic differs from the Inorganic Process. In the Social Process, the action is determined by knowledge and morality, instead of sense-impressions and ideas, or by the contending energies of inorganic nature along the line of least resistance. It is in this way that the Social differs from the Organic Process.

In the evolution of every solar system throughout the Universe, there comes a time on some of its planets when the wasteful expenditure of its energies according to the first law of expenditure produces conditions favorable to life and mind and society; for the development of intelligent beings is as much within the province of the Process of every solar system in the Universe as is the evolution of all other forms,—elements, chemical compounds and plants. Considering the process of the solar system as a whole, Man is as natural a form of matter as a chemical compound, only one may be produced in an instant, while the other takes millions of years; and, given the elements and energies of Nature during the

solar process, both invariably occur. Things in the course of aeons of time have adjusted themselves, or will adjust themselves, blindly, according to the first law of the expenditure of energy, not only here in our solar system, but in all others throughout the Universe, resulting in coincident favorable conditions producing life, mind and society. But think of the cost when we estimate the enormous waste of energy to accomplish this result! Do we see any of that fine adjustment of means to ends here that indicates mind, or any of that perfect expenditure of energy that demonstrates morality? The Earth to-day is probably the only habitable planet in our solar system, yet in comparison with the rest of the matter of the system it is only a grain of sand. All the energy expended in the entire system up to date, following the first law of the expenditure of energy, could accomplish no more than this! But let us hope, when the Earth is dead as the moon now is, that the outermost planets may be teeming with life. What explanation has Idealism for this enormous waste of energy?

That which it takes millions of years for inorganic nature to do by her blind and wasteful methods here on Earth, man accomplishes in the brief space of a lifetime through intelligence and morality. The origination of a new species of animals, for example.* Things are as they

* "Origin of Species by Mutation," by Hugo De Vries.

are in Nature, because both matter and energy are indestructible, and, however the arrangement of matter in the Universal Process, the dissipation of energy according to its first law always enables matter to complete its cycle of development from primal elements, through chemical compounds, plants and animals, up to human society,—as will some day be definitely proved by communicating with other worlds and by showing the habitability of at least some of the planets in other solar systems, or their potential habitability in the course of aeons of time.* Even as wasteful as inorganic nature is, it could not be that the Earth is the only habitable planet in all the Universe, as Alfred Russel Wallace would have us believe in his book, "Man's Place in the Universe." It is the character and quality of matter and energy to develop the Social Process just as it is for them to manifest themselves in the Inorganic and Organic Processes. But as the evolution of the stellar systems is controlled by the blind expenditure of energy along the line of least resistance, we should expect to see the same waste of energy there—uninhabitable planets, asteroids incapable of holding moisture and atmosphere, and satellites which are only vast surfaces of reflecting stone—that we see here in the solar system under similar conditions.

*Prof. Simon Newcomb "Sidelights on Astronomy," p. 122.

Every thing is natural, and when looked at rightly there is no more mystery in one thing than another. If man had sufficient power, even with his imperfect mind, he could make improvements in the solar system which would direct its wasting energies to human advantage, as he could make of the Earth a veritable Paradise; but as yet, owing to lack of conscious social control, he can only criticize, not amend.

The Organic Process. If the elements and energies of Nature were not susceptible of any ways of dissipating energy other than the three laws of motion, or the first law of the expenditure of energy, then the universal Process would have stopped with inorganic compounds. But happily for us in their infinite strivings and interminable combinations, the elements and energies of Nature have developed conditions here on Earth admitting of new possibilities. For example, the elements oxygen, hydrogen, nitrogen, carbon, and other elements and the radiant energies of light, heat and so forth, in the Universal Process, we see going on throughout space, reached on our Earth the high degree of development of purely chemical compounds; then the action and interaction of the radiant energies of Nature upon them produced an entirely new system of existence, consisting of life and its possibilities, resulting in a new

law of the expenditure of energy, that of living beings controlled by mentality.

Whenever in the primordial world some delicate chemical compound arose which could use the changes produced in it by its surrounding conditions to perpetuate its existence by varying the Law of Action and Re-action, so that the expenditure of its energies was not equal and opposite but resulted in an advantage to itself, that was the beginning of the Organic Process here on Earth; and during the following countless centuries, whenever the compound's reactions to the radiant energies of Nature produced in it the senses and the intellect, and its reactions to the gravitant energies produced in it the senses of taste and smell, followed by the development of the feelings of appetite, selfishness, and love, then human beings, as seen in mankind to-day, were developed.

A great deal has been made out of the fact that up to date no scientist has succeeded in creating life out of its original elements; yet the tendency of scientific endeavor is in this direction and its achievement may be accomplished any day. The experiments of Dr. H. Charlton Bastian in his two works: "The Nature and Origin of Living Matter" and "Studies in Heterogenesis," for example, show that the opponents of Naturalism are more given to overlooking what has been accomplished than in en-

deavoring to solve the problem. But this is to be expected when the love of truth is not the motive of the investigation, but apologies for a philosophy upheld by economic considerations, not by evidence. Not only this: all the bright minds of Christendom are retained by the defense, while the prosecution is left to novices with no retainer but a labor of love.

The Social Process. With the origination of animal man, the world of human beings, during countless centuries of action and interaction in the expenditure of their energies (feelings and emotions) in society, followed by the reaction of the human race upon the individual, developed the Moral Sense (a fifth law of motion) from the point of view of feeling, and the Social Sense (a sixth law of motion) from the point of view of intellect, with the function of expending the mentally guided energies of individuals through the knowledge and morality of the race. In the meantime, the reaction of the individual to the gravitant energy of appetite, selfishness and love, resulted in the evolution of the strongest dynamic in the whole world, that of Religion. The evolution ends in another system of existence of a superior kind, namely, human society, controlled by knowledge and morality and motived by religion, being the Social Process, the highest or-

ganization of matter here on Earth, and an example in kind of the most economic expenditure of energy in the whole Universe.

Looked at from a dualistic point of view, man is an insignificant being; but from the naturalistic point of view, he is a representation of all Nature that has gone before him in the evolution of the present solar system; and let him be ever so small, he holds within himself the stored energies of billions of years. He is the very acme of all creation, the greatest being that can be produced out of the elements and energies here on Earth. Man is a repetition of Nature, created during aeons of time. He is a miniature Nature; hence he is not arrogant in explaining Nature in the terms of his own being, but living up to his birth-right and vested interest in Nature and is thereby justified forever in abandoning the soul abasement of our traditional theory of things.

VI

THE EXPENDITURE OF ENERGY

Scientific Naturalism shows that all energy expends itself along the line of least resistance and that it has three forms.

First. Energy as expended in the physical, Inorganic Process, taking the line of least resistance as determined by the contending energies in opposition and neutralization, resulting in complete waste of energy, that is, energy expended without any object or end.

Second. Energy as expended in the Organic Process, taking the line of least resistance, as determined by mentality, resulting in an economy of energy for the benefit of the individual using it.

Third. Energy as expended in the Social Process, taking the line of least resistance, as determined by knowledge and morality (the Moral and Social Senses), resulting in the perfectly economic expenditure of all energy for the benefit of the individual through Society.

The first law of the expenditure of energy ends in a comparatively fixed order of equilibriated forces—solar systems, chemical compounds, molecules, atoms. The second law of the expenditure of energy ends in a dynamic system of order, namely, plants and animals. The third law of the expenditure of energy ends

in the highest system of order in all Nature, a compound, dynamic order, which not only moves itself, but which permits the independent movement of all its units, namely, human society.

Under the first law all the energy of the interacting bodies is used up to the particular advantage of none of them, but ultimately in the course of the Universal Process results in conditions favorable to the higher forms of existence, —while under the second law the interacting bodies not only use all their own energy, but also all the energies of Nature that they can control. To illustrate both processes: When two inorganic objects come within each other's field, the energy of each is used up in the reaction, and neither is in the least benefitted, neither having any special advantage over the other; their energies being dissipated aimlessly along the line of least resistance in opposition and neutralization. Not so with living beings. When they come within each other's field, the energy of each is used in self-preservation in the struggle for existence, being dissipated along lines controlled by the mentality of each of the organisms. But if the living beings are friendly, man and the domestic animals, for example, then their energies are often expended in co-operation, following ideas of perfect economy, and none of it is lost. In the case of human so-

ciety, under the third law, perfect mentality and scientific morality, all the compounds of Nature, soil, water, atmosphere, and all the radiant energies, such as light, heat, electricity, mechanical energy, and the energies of all the individuals composing society, are used for human benefit; and ultimately the race will be combined through the supreme social dynamic, Religion, into one vast Social Process; then all the energies of both the Inorganic and Organic Processes, guided and directed by scientific knowledge and positive morality, will be expended with perfect economy for social preservation, and human perfection will be attained here on Earth.

The first function of mentality (the second law of the expenditure of energy in Nature) in the Organic Process is to direct the energies of the organism possessing it; its second function is to direct the blind energies of Nature so that the organism possessing mentality may the better adapt itself and its species to the environment. The possibilities of human life are great, because under this second law of expending energy (mentality) all the energies of the organism and many of the energies of Nature can be turned to individual advantage, and the concept of economy in the sense of saving, that is, turning the expenditure of energy to individual advantage, is seen for the first time in all

Nature. Under this second law, energy for the first time is expended according to design or purpose. Ultimately the individual becomes the object for which all Nature strives and labors, and the energies of Nature that heretofore dissipated themselves blindly, under the first law of the expenditure of energy, are now used by the intelligent individual for his own advantage; and the process ends in the highest product of what mind, independent of social control, can do here on Earth.

The third law of the expenditure of energy in Nature, the Social Process, is seen in human associations, tribes, nations and civilizations, and results in examples of the greatest economy of energy seen in the whole Universe,—all energy expended according to knowledge and morality. The expenditure of energy directed by mentality is an improvement upon the blind battling of the energies of the Inorganic Process, and begins where inorganic nature ends. And just as mentality directs to individual advantage the contending and wasting energies of the Inorganic Process, so social expenditure, through the Moral and Social Senses, directs to social advantage which is the greatest individual advantage in the end, the intellectually guided but conflicting energies of the individual. For just as the energies of Nature ended in neutralization and exhaustion, resulting in a fixed order—

inorganic compounds,—so does the conflict of the energies of the individual (feelings and emotions) culminate in a compound dynamic order, the tribe, the nation, which will ultimately end in a perfect controlment of the individual in the expenditure of all his energies in a universal socialization of humanity. Energy expended according to intellect, in fact, is a fourth law of motion, while energy expended according to the Moral and Social Senses are fifth and sixth laws of motion. It is strange indeed that up to date the world has stopped short with Newton's three laws of motion, thus making individual and social actions, while totally different from action in the inorganic world, yet not subject to any law whatsoever. This is but one of the many absurdities of the idealistic philosophy.

VII

THE UNITY OF NATURE

Scientific Naturalism contends that all the compounds of matter — elements, chemical compounds, organic bodies and social organizations—are produced by the original atomic motions as determined by external radiant energy in its various manifestations. Gravitant energy, in the Inorganic Process, manifests itself as chemism; in the Organic Process, it shows itself as appetite, selfishness and love; while in the Social Process, it reaches the acme of its development in the sublime emotion of Religion. Each of these forms of energy is but a development of the other. But is not this to be expected? Are we not matter? Heretofore, philosophers have looked upon our motive-powers as something totally distinct from anything else in Nature; hence it was impossible for us to understand ourselves except by postulating a supernatural entity, the Absolute, and reading the Universe backwards. But scientific Naturalism shows our kinship to Nature, not only on the motive, but on the intellective side of our natures as well. It shows that sensation, ideas, knowledge are the products of external radiant energy—light, heat, pressure, mechanical energy and so forth—as stored in the human organism, language and institutions

after countless ages of experience with the energies of Nature and the energies of society. It shows that chemism, selfishness, love and religion are but developed forms of the original gravitant energies of Nature produced by the organization of matter in our bodies and brains. We are but the developed forms of the primitive elements and energies of Nature, and it is by understanding ourselves that we can understand Nature and thus ultimately reach absolute knowledge and perfect action.

In the Organic and Social Processes the radiant energies are the directing powers of Nature, while the gravitant energies are the motive-powers. The radiant energies of Nature, light, heat and so on put in touch object with object throughout the Universe. The senses and the intellect make us aware of our immediate surroundings, while the Moral and Social Senses enable us to understand society and our relations to it. The knowledge gained from both orients us as to Nature as a whole. On the other hand, gravitant energy in the form of chemism is the motive-power of inorganic compounds and holds them together; as appetite, selfishness and love, it is the motive-power of living organisms and secures their self-preservation in the struggle for existence by combining all their energies to that one end; while in the Social Process we see that the gravitant

energy of Religion is the greatest motive-power of society and by overcoming the other emotions will ultimately bind the whole race together in one vast process.

In general, radiant energy is the communicating and directing power of the Universe in all its manifestations, while gravitant energy is the motive and binding power as seen throughout all its forms. Thus we arrive at an ultimate explanation of Nature by showing its relation to ourselves, and an ultimate explanation of ourselves by showing our relation to Nature.

Scientific Naturalism shows us that Nature is self-sufficing; that chemical compounds, plants, animals, the human organism and society itself are but forms of matter undergoing transformation in the Universal Process, the one as natural as the other; that mind and morality, love and religion, are but manifestations of the simpler energies of nature. None, however, but a scientific mind is able to trace the evolution of things from the primal nebulous mass of the nascent solar system up to the highly developed product, Social Man, as seen in the world to-day, for the uninitiated are soon lost in the labyrinths of ignorance and error, metaphysics and pseudo-knowledge. Nothing but a profound study of all the sciences can enable us to put a naturalistic concept of things in the place of the simple concept of tradition. But by con-

stantly pondering on the Universal Process of Nature, Man at last can show his kinship to matter and energy and understand his antecedents in the primal elements and energies of Nature,—thus tracing all energy to one source and showing that it all has one destiny.

VIII

THE LAW OF REPETITION

The question may be asked: What is the use of knowing what we are and what the Universe is? The answer is: The function of this, as of all knowledge, is to acquaint us with our environment so that we may consciously adapt ourselves to it, and thereby perpetuate our existence and ultimately, through social organization, reach the perfect expenditure of all energy, a system of existence in which the human race will no longer be the sport of the environment, natural and economic, but will be the arbiter of its own destiny.

When one looks at Nature from a naturalistic point of view, and sees the enormous development that the elements and energies of Nature have made, he at once sets about to find the law through which this wonderful evolution has been accomplished. He is met at the start, as we have seen, with the fact of the eternal action and interaction of the internal gravitant energies of matter with the external, radiant energies constituting the conditions of matter, and in the end discovers that the primal cause of evolution is the action and interaction of these two kinds of energies operating under the Laws of Repetition, thus producing all the phenomena of Nature.

The Law of Repetition has two forms,—internal and external. In external repetition, radiant energy constantly repeats and registers itself in a body, thus changing its condition. In internal repetition, the gravitant energies of a body constantly repeat its form as modified by external energies. Thus the external energies cause the changes, while the internal energies preserve them, the combined action producing the evolution of the Universal Process. The two forms of repetition cause all the wonderful forms we see in Nature, the inorganic, the organic, and the social.

Differentiations in the Inorganic Process. From the beginning of the Universal Process, the external radiant energies of Nature have been constantly differentiating and determining the forms of the internal gravitant energies. First, differentiating matter into its original particles, then producing the various elements, followed by an incalculable number of chemical compounds, finally effecting the differentiation of the inorganic into the organic. All these changes were made by the reciprocal action of the radiant upon the gravitant energies of Nature. The external radiant energies effected the changes, the internal gravitant energies preserved them, each working according to the Laws of Repetition.

All that the repetition of an energy in an inorganic compound can do is to create its conditions. But with the origination of the Organic Process, the efficiency of the external energies to produce changes in the internal energies (forms of matter) was greatly increased, because the chief difference between the Inorganic and the Organic Processes is the effect the external energies have upon each of them. This results in three great differentiations in the Organic, and three in the Social Process.

Differentiations in the Organic Process. The first great differentiation made in the Organic Process by the external radiant energies was that of individual and species through death and reproduction. Life was thus enabled to live continuously in the species through the death of the individual; and instead of being a brief existence environmentally produced, it became a process ending in the sublime evolution of the human race. Death became an individual phenomenon; life a racial one, through which the higher organisms were made possible. By differentiating the Organic Process into individual and species, the race lived forever through the constant death and reproduction of its individuals. This is no hardship to the individual, however, for while his existence is brief, yet he has repeated in his life, not only

the life of the race, but also the whole cycle that has preceded him.

This was followed by a further differentiation of the Organic Process into plants and animals, a division of labor in the building up of higher and higher compounds, which, in general, gives all the active work to animals, all the static, to plants, utilizing the labor of each in developing higher and higher organisms in their union as food through the developed gravitant energy, appetite.

Further, the Organic Process was differentiated into the male and the female sexes, a division of labor in acquiring psychical experience with the environment, in which life was enabled to have the experience of two individuals at each reproduction, secured in the union of the sexes in coition through the sexual instinct, love, a higher form of appetite.

Differentiations in the Social Process. The first differentiation that the external energies made in the Social Process was that of individual and nation, a division of labor which has for its function, primarily, the accumulation of property. Up to this time, the tribe was motived solely by Religion—the race for all, and all for the race;—but with this differentiation, selfishness was evoked as an additional incentive to produce property, and the individualism that

we see reaching perfection in the world to-day was initiated.

The next division in the Social Process made by the external energies was the differentiation of humanity into specific classes—plebeian and patrician, aristocratic and proletarian, exploiter and exploited, and other classes. The function of this differentiation in general is the preservation of property by taking it out of the hands of the producers and putting it in the hands of privileged classes, in order to keep it from being wasted. This achievement is accomplished blindly through selfishness, involuntary co-operation, saving for the race, even by immoral means, the property so necessary for its development.

The last great differentiation the external energies made in the Social Process was its differentiation into the elements of order and the elements of progress, the elements of progress securing changes in the Social Process, the elements of order preserving them. This differentiation has for its function primarily moral development.

These three great differentiations in the Social Process would be of little use to the race, if there were not some power whereby it could utilize them. This is accomplished through Religion. The specific functions of Religion are to see that the property produced by the

laborers is finally returned to them through morality; that the elements of order and the elements of progress unite peaceably to produce the future Social Process; and, finally, that Religion be the supreme social dynamic over selfishness and love, ultimately destroying war, poverty, vice and crime, ending in the perfect expenditure of all energy in the socialization of humanity.

It is through these great differentiations in the Organic and Social Processes that life is enabled to secure the necessary experience with the environment, and to accumulate the necessary high forms of matter (property) in the environment which will enable it in the Social Process to overcome the environment, natural and economic, through mentality and morality, and ultimately to be the arbiter of its own destiny. To-day the race is still controlled by its environment, natural and economic, but as it is the very nature of mentality and morality to direct the expenditures of the energies of Nature, it stands to reason that the time will come when they will reach a sufficient degree of development to enable the Social Process to control its enviroment, natural and economic; then it will be that all energy will be expended with perfect economy, the supreme law of ethics; and the internal gravitant and the external radiant energies of Nature will reach the

acme of their development in the perfection of the human race here on earth.

So we see that no matter how wide the differentiations radiant energy may make in the forms of matter in the Inorganic, the Organic and the Social Processes, gravitant energy ultimately brings the parts together as in the beginning, and each energy at all times acts according to the Laws of Repetition.*

* For a complete discussion of the relation of the environment to the Inorganic, the Organic and the Social Processes, see the author's book : "The Future of the Human Race."

IX

NATURAL SELECTION *

The question may be asked: What part does Natural Selection play in the evolution of the three processes of Nature? When explaining Nature in wider terms, it is incumbent upon one to show how the lesser laws of Nature are included in the larger ones. The energies of the environment, expending themselves according to the Law of External Repetition, cause a variation in organic forms of matter. Those forms that vary most in reaction to the energies of Nature best adapt themselves to the environment. This is how it is that animals, in general, are more highly developed than plants. Among organic bodies those that can not vary, or vary too much, in response to external energy in its various manifestations, cease to exist. This result is called Natural Selection. It is only a part of the process of the repetition of the various forms of matter in Nature. Natural Selection considers the species as being passive, looks only at the effect of external energies upon organic forms when there is an active side that has equal part in the process of evolution. The internal energies of Nature

* This section is also found in the author's essay: "The Future of the Human Race."

have as much to do with the production and perpetuation of organic forms as have external energies. For what would it avail an organic form, if, after the struggle for existence had selected for it some advantage over its competitors, it had not the power to perpetuate the advantage through internal repetition? As a result, Darwin, invoking only Natural Selection, has no explanation of heredity and variation except that they occur spontaneously in Nature.* Heredity is due to internal energy operating according to the Law of Internal Repetition; variation is due to external energy operating according to the Law of External Repetition.

Natural Selection, as the shibboleth of the Naturalists, in the great conflict between Science and Theology during the latter part of the Nineteenth Century, of necessity contained only as much truth as was suitable to the propaganda of Science among the masses, and not the completed formula of a Scientific System of Philosophy. This should not be expected of any shibboleth. Natural Selection, however, effected the greatest revolution of the Nineteenth Century; but, having served its day, new formulæ must be discovered to continue the work; for the revelation of the laws of Nature occurs

* "Descent of Man," p. 44; "Origin of Species," p. 10.

just as the mentality and morality of man develop.

The incompleteness of Natural Selection as an explanation of the origin of things is fully seen in the explanation of the survival of the fittest among inorganic compounds. No one knows better than the chemist the power of chemism in originating chemical compounds under the proper external conditions, and he would never dream of thinking that external conditions were the sole cause of the origin of any compound. It is true that chemism can not act except under the proper external conditions; but it is also true that the motive power of all activity is internal energy, not external conditions. When the internal energies have once formed a compound, external energies, in the case of the elements, can not destroy or modify it under any known conditions*; hence there can not be any selective power in them. All inorganic compounds, of a given kind, subjected to the same conditions either survive or perish. All are fit or none are fit: there is no variation in them. But as we rise in the scale of development, external energies in all their manifestations, light, heat and so forth in the inorganic, sense-impressions and ideas in the organic, knowledge and morality in the social

* There may be an exception in the case of radioactive bodies.

worlds become more and more selective in their effects, until finally in the perfect Social Process of the future, they will become completely dominant and control the origination of most of the bodies and organization of Nature. Among inorganic compounds, external energies are seen to simply form the conditions of the operations of the internal energies. But among organic compounds, external energy not only forms the conditions but selects the fittest to live through an intense struggle for existence. The ultimate social organization will be under the complete control of humanity.

It will be noticed that in the Organic and Social Processes the motive-power is from within, not without. The environment does not prompt an animal to seek food, but hunger does. External energy does not cause animals and mankind to make self-preservation the first law of Nature, but selfishness does. External energy has nothing to do with causing animals of the same species to mate with their own kind, but sexual instinct has. External energy has little to do with the social conflicts between the elements of order and the elements of progress in society, but Religion has. The motive-power throughout all Nature is internal, not external.

The Laws of Repetition make organic forms a result of the combined operation of internal

and external repetition, while Natural Selection makes the origin of organic forms a result of the operation of external energies alone. It is not only external energies that originate species, but the co-operation of external energy with internal energy according to the Laws of Repetition. Natural Selection can act only when there is a struggle for existence, as in the organic world, whereas the Laws of Repetition act under any and all conditions and throughout all Nature at any and all times. While the Laws of Repetition are different in degree in the inorganic, the organic and the social worlds, yet there is no difference of kind. Natural Selection is scarcely seen among inorganic compounds, reaches its maximum efficiency in the organic, begins to diminish with the highest mentality, as seen in artificial selection by mankind, and we cease to operate with the perfection of knowledge and morality in the future Social Process. While the action of external energies, in all their manifestations has a selective power over all compounds, bodies and organizations, yet the finished phenomenon is the joint work of the internal and external energies co-operating according to the Laws of Repetition.

Among social organizations, the insufficiency of Natural Selection, as an explanation of the survival of the fittest, is still more glaringly

manifest. Social organizations, not satisfied with external conditions, modify them to suit their existence, set aside Natural Selection and substitute in its stead Social Selection; yet the operation is performed exclusively according to the Laws of Repetition, and is successful in proportion as the mentality and morality of the race expends energy with perfect economy.

The Law of Natural Selection as an explanation of origins should be restricted to that part of Nature where it belongs—the organic and the social, not under the control of humanity,—and should not be extended to all Nature, as some of Darwin's followers would have us do.

All compounds, all bodies, all organizations have some power in determining their own destiny with the external energies surrounding them. The facts are that nothing can exist except when both the internal and external energies of Nature act together, and that neither has the power to act without the other. But as we rise in the scale of evolution, the external energies become less and less powerful, because they register themselves in the bodies constituting the internal energies of Nature, thus creating directing-faculties, until finally we reach in mankind a perfectly autonomous process capable of counteracting in a measure all external conditions as they now exist. And the time will come when this process will be so

perfect that it will be able to expend all energy as it desires, and thus reach the perfectly economic expenditure of all energy in Nature; and Natural Selection among men then will be completely superceded by Social Selection, through the Laws of Repetition having originated a perfectly autonomous organization—the Social Process.

X

SCIENTIFIC NATURALISM

Thus we see even on a brief review of the various phenomena of matter and energy that Nature is one. Man has ever dreamed of a unity some place. He first sought it in an allegorical and symbolical theory of things, which in different forms exists even to-day. Then followed metaphysical speculations; to-day, represented by Idealism which postulates a spiritual Entity outside the Universe or immanent in the Universe as the creator of everything. It is soul-satisfying to many minds because it attempts to bridge the theories of our fathers with the science of to-day by interpreting the one in the terms of the other. In science man has either attempted an objective synthesis, such as that developed by Herbert Spencer, which leaves out of consideration the chief motive-power of man, Religion, or a subjective synthesis, such as that developed by Auguste Comte, which, while it considers the motive-power of Religion, yet, by limiting the sphere of scientific investigation to a study of the laws of Nature, severs man from the causal relations of the Universe and thereby cuts him off from the ultimate knowledge of the directing-powers of Nature,—whereas our traditional

theology really makes all knowledge impossible by taking its allegorical and symbolical statement of the facts as the literal truth. As we have seen, we have no way of understanding anything except through Nature immediately around us and in us. So Scientific Naturalism shows us that the subjective synthesis of science is a representation of the objective synthesis of Nature, and that our allegorical and symbolical explanation of things (Theology) is as much of the truth as the mind of primitive man was capable of understanding, knowledge being acquired by Man in successive forms, each containing the truth in proportion to human development.

If we wish to understand Nature in all its forms, it must be constantly kept in mind that there is nothing but energy; that it has two forms—radiant and gravitant; that gravitant energy produces the forms and radiant energy conditions them. It must never be forgotten that Nature is a process; that Nature is always going; that there is nothing but change; and that the fundamental Law of Nature is the Law of Repetition. All the various forms of matter—the inorganic, the organic and the social—are but repetitions of the forms of matter that have gone before them as determined by radiant energy in its various manifestations. The Organic Process is a repetition

of the Inorganic under different conditions; the Social is a repetition of the Organic under different conditions. The size of an object in which Nature works a process has nothing to do with it. It may be infinitely great or infinitely small, the solar system, or an atom, our individual bodies, or the social organization comprising the entire race. Not only that: the Inorganic Process made millions of essays, resulting in innumerable forms which were but repetitions of one another except as modified by external energies, and which finally resulted in a chemical compound capable of becoming organic. Then the Organic Process made millions of essays, resulting in innumerable organisms which were repetitions of one another, except as modified by external energies, finally ending in the production of the individual expending energy according to mentality. Then the Social Process made millions of essays in social organization (clans, tribes, nations) which were repetitions of one another except for variations made by external energy in the form of mentality, and which have ultimately ended in our civilization to-day expending energy according to knowledge and morality. The only difference in each of these cases is a difference of internal form and of external conditions lasting through aeons of time; each grew out of and will ultimately be resolved into the elements and energies of Nature.

All the phenomena of Nature when looked at rightly show that the gravitant energies constituting man are identical with those constituting Nature, and to know the one is to know the other. Not only this; but that the various external radiant energies of Nature are a repetition of one another in different bodies and are identical, and to know the one is to know the other. Further, that the sensations, feelings and ideas of the Organic Process become the Moral and Social Senses of the Social Process and are identical in composition. These energies in the Inorganic, the Organic and the Social Processes are identical only they act in different bodies and are differently organized.

Thus through the Law of Repetition we know that our minds and characters are identical with the radiant and gravitant energies of Nature. We know all Nature by showing that we are nothing but a repetition of the energies of Nature passing through the Universal Process which we see going in Nature to-day. And whenever in the course of time, Man has developed far enough in the process of evolution to have within himself sufficient representations of the phenomena of Nature to anticipate the whole, he will be able to know all Nature by being identical with it. It is thus that we shall be able to comprehend what the Universe is, conceive infinite time and infinite space by looking in upon ourselves and seeing the infinite

repeated in us, and understand the inmost nature of things. Just as the time was when life was not self-conscious, then became self-conscious and class-conscious and to-day is imperfectly socially conscious; so the time will come when we shall be universally conscious.

The human situation when looked at from a naturalistic point of view has heretofore had about it an independence that is calculated to deter timid souls from final acceptance; however, it was no such spirit as this which made of man the being he is to-day,—but rather the opposite spirit, that of moral courage, intellectual honesty, love of truth and faith in the ultimate triumph of humanity in solving the riddle of existence and in determining its own destiny. It may be deemed pious to stand in awe before the mysterious phenomena of Nature; it is scientific and ethical to try to unravel them for the benefit of humanity. And it is in this spirit that Scientific Naturalism attempts the solution of the stupendous problems confronting the human race to-day.

And when once the great minds of the world find it economically profitable to unravel the processes of Nature instead of apologizing for the beliefs of our ancestors, they will make short work of the mystery of existence, and that era of perfect life will begin which has been hoped for since the dawn of conscious existence and foretold by poets and seers in all ages.

While Scientific Naturalism causes the sublime hopes of tradition to vanish, yet it gives the race in their stead a life to be realized here on earth which transcends them in sublimity and utility a thousand fold in the conscious life of humanity guided by science and morality and motived by Religion, a socialization in which all energy will be expended with perfect economy, the supreme law of ethics, realizing the highest possible development that the elements and energies are capable of on this earth.

When we look out into the starry depths, or gaze upon things about us, or think of the many different persons we ourselves have been, or laugh at the crude efforts of life in the imperfect forms about us, or weep at the pain and suffering thrust upon us through contact or sympathy, or protest against the greed of men and the vanity of women, or feel the fire of the sun, the beauty of the moon, or shudder at the ravages of war, or glance at the interminable procession of men and women marching to their graves oblivious to the heights and depths of life, or contemplate the arrogant oppression of the mighty, the patience of poverty, or remember the dash of the storm, the bite of winter, or think about the nature of the atom, the mystery of heredity, or picture to ourselves Socrates discussing with his disciples the immortality of the soul, or Jefferson writing the Declaration of Independence, a

mother kissing her babe, an impassioned youth climbing to the trellised window of her he loves, or when alone in the midst of night, pause in living as if in the presence of existence itself, and ask ourselves the question: What does it all mean?—know that all this and more, nebula and atom, eternal time, infinite space, unlimited power, great Nature itself is but a different manifestation in all its forms of that which constitutes our very being. To see ourselves in everything and everything in ourselves is to know what Nature is. What is it? What is it? What is it? cried at Nature at every angle answers back: It is you! It is you! It is you! The dreams of our childhood, which are the dreams of the infancy of the race, are allegories of this great truth that we now realize in our heart of hearts. Nature in us looks upon itself. In our multiple consciousness Nature evolves a world within a world enabling itself to know itself through a repetition of itself. And when death comes to us Nature will still remain and an infinite number of beings will live over again this life we love so well,—and finally, when the great cataclysm supervenes at the end of the process, that is not all, for the matter and energy that moves in us to-day will appear again and again in suns and worlds and lives and minds forever and forever.

HARVARD UNIVERSITY

http://lib.harvard.edu

If the item is recalled, the borrower will be notified of the need for an earlier return.

WIDENER
SEP 0 4 2007
CANCELLED

76 H
D
159

2007

Thank you for helping us to preserve our collection!